U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject:

Date: 12/9/87 **AC No:** 150/5345-45A
Initiated by: AAS-200 **Change:**

LIGHTWEIGHT APPROACH LIGHT STRUCTURE

1. PURPOSE.

a. This advisory circular presents the specifications for lightweight structures for supporting lights as used in visual navigational aid systems.

b. This advisory circular has been editorially updated for reprint/stock purposes only. There were no changes made to the content of the advisory circular except to revise qualification procedures in paragraph 4.1, and renumber the document to AC 150/5345-45A.

2. CANCELLATION. AC 150/5345-45, Lightweight Approach Light Structure, dated May 10, 1973.

3. BACKGROUND. Approach lighting systems are installed in the approach area of a runway and can be a hazard to landing aircraft in the event of an undershoot or to takeoff aircraft in case of overrun. Because of the need to install the lights at runway elevation, the supporting structures involved can be quite high, depending on the terrain in the approach area. Lightweight structures of a frangible nature are required to support the lights under all operating conditions yet so designed to minimize damage if accidentally struck by an aircraft.

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION
LIGHTWEIGHT APPROACH LIGHT STRUCTURES

1. SCOPE

1.1 Scope. This specification covers the requirements for lightweight structures to be used in visual navigational aid systems for operation of aircraft at airports.

1.2 Classification. Two types and two classes of structures are covered by this specification.

1.2.1 Types. Structures of the following types are covered by this specification:

Type 1 - Lower to service type.

Type 2 - Climb to service type.

1.2.2 Classes. Structures of the following classes are covered by this specification:

Class A - Designed to withstand wind velocities up to 75 miles per hour with 1/2 inch of ice on all surfaces.

Class B - Designed to withstand wind up to 125 miles per hour without ice.

2. APPLICABLE DOCUMENTS

2.1 General. The following documents, of the issue in effect on date of request for qualification, form part of this specification and are applicable to the extent specified herein.

2.1.1 FAA Specifications and Advisory Circulars.

FAA-E-2325 Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights

FAA-E-982 PAR-56 Lampholder

AC 150/5345-1 Approved Airport Lighting Equipment

2.1.2 Federal Specification.

RR-S-0011301 (FAA) Safety Equipment, Climbing

2.1.3 Military Specifications

MIL-STD-810 Environmental Test Methods

(Copies of FAA specifications may be obtained from the Federal Aviation Administration, Configuration Control Branch, AAF-110, Washington, D.C. 20591.)

(Copies of FAA advisory circulars may be obtained from the Department of Transportation, Distribution Unit, TAD-484.3, Washington, D.C. 20590.)

(Copies of Federal specifications may be obtained from General Services Administration offices in Washington, D.C., Boston, Chicago, Denver, Kansas City, Mo., New York, San Francisco, and Seattle.)

(Copies of Military specifications may be obtained from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

3. REQUIREMENTS

3.1 General Functional Requirements. The structures specified herein are intended for use in airport approach lighting systems to support various lighting fixtures accurately oriented and to be designed to crumble or collapse to minimize damage in event of accidental impact by aircraft during takeoff or landing operations.

3.2 Equipment to be Supplied by the Contractor. The structures shall be supplied complete with all accessories, including mounting base, adjusting and connecting hardware, light bars where required, installation instructions, safety climbing equipment if of the climbing type; and lowering, raising, and lamp aiming hardware if of the lower to service type.

3.3 Environmental Conditions. The structures and all accessory equipment shall be designed for outdoor use under the following environmental conditions:

3.3.1 Wind. The structures shall be designed to withstand the following wind loads when installed with all lighting equipment attached. The structure shall not have any permanent deformation as a result of the wind load.

Class A structures - Wind velocities up to 75 miles per hour and with all surfaces coated with 1/2 inch of ice.

Class B structures - Wind velocities up to 125 miles per hour without ice.

3.4 Materials. The structures shall be constructed of aluminum alloys and anodized with a matt finish. All hardware components shall be stainless steel of the 300 series (Type 18-8). Base mounting plates, where required, shall be galvanized steel.

3.5 Lamp Fixture Load. The lamp fixtures to be installed on the structures consist of several configurations of numbers and spacings as shown in Figure 1. The PAR-56 lampholder conforms to FAA Specification FAA-E-982, and weighs approximately 5-1/2 pounds with lamp installed. The PAR-38 lampholder conforms to FAA Specification FAA-E-2325 and weighs approximately 2-3/4 pounds with lamp installed. The structures may be designed to support the various lamp load configurations using either single or multiple structures.

3.6 Height. The structures shall be designed to permit installing the lights to any height from 6 feet to a maximum of 40 feet. The design shall permit a final height adjustment of ±8 inches.

3.7 Weight. The structures shall weigh not more than 2 pounds per lineal foot in height per lamp. For instance, a 40-foot structure supporting a single lamp cannot weigh more than 80 pounds. A 40-foot structure supporting 5 lamps utilizing 2 vertical supports and a cross member cannot weigh more than 2 pounds/foot X 40 feet X 5 lamps = 400 pounds. This weight does not include base mounting hardware or light fixtures and wiring but does include safety climbing equipment where used.

3.8 Frangibility. The structures shall be designed to support the desired lighting load under the specified wind and ice conditions, yet be frangible and cause minimal damage when struck by an aircraft. The structure shall not wrap around the aircraft but shall crumple or collapse on impact.

3.9 Assembly. The structures shall be made in sections to provide easy shipment and handling. The sections shall not be greater than 20 feet in length and shall be designed for rapid field assembly without the use of special tools. Welding together of sections in the field is not permitted.

3.10 Deflection. The structures shall be sufficiently rigid to prevent more than ±2 degrees of deflection of the light beam in the vertical axis nor more than ±5 degrees in the horizontal axis when subjected to a wind velocity of 60 miles per hour and coated with 1/2 inch of ice on all surfaces.

3.11 Maintainability. The structures shall be designed to permit maintenance of the lights by one man without the use of additional equipment such as man-lifting machines or ladders. The maintenance requirements may be met

by two different designs -- a lower to service type or the climb to service type.

3.11.1 Lower to Service Type. The structures may be designed to be lowered to ground level or by lowering only the lighting equipment itself. All lowering equipment shall be supplied as part of the structure and shall be considered part of the structure as far as weight and frangibility are concerned. The lighting equipment shall retain its original vertical and horizontal alignment and be securely locked in place after maintenance operations. The design shall permit, while at ground level, the lights to be aligned horizontally and to permit vertical aiming from zero to plus 15 degrees.

3.11.2 Climb to Service Type. For the climb to service type, the structure shall be able to support a 200-pound man without deflecting the light beam in the vertical axis by more than 1-1/2 degrees. Means for climbing to the top of the structure shall be part of the structure design and shall not require the use of a separate ladder. Ladder steps, as part of the lattice or lacing design, will be permitted provided their spacing is not more than 18 inches between steps. The structure shall be equipped with a safety climbing device conforming to Federal Specification RR-S-001301 (FAA) modified to meet the frangibility requirements in 3.8. For heights above 10 feet, the structures shall contain a lightweight work platform or walkway to permit easy access to all lighting equipment thereon. Aiming devices for the lights are not required for this type of structure.

3.12 Foundations. The foundations will normally be of concrete, with the base of each structure secured to the foundation. Leveling of each structure shall be by simple adjustments.

3.13 Ground Wire Lug. A copper lug shall be provided and secured to the structure base for a #6 ground wire connection.

3.14 Lamp Wires. Each lamp will require two #12 wires (supplied and installed by others). The structures shall be designed so that there will be no exposed electrical wires. All wire shall be enclosed in wireways designed as part of the structure.

3.15 Cleaning. The surfaces of all materials used in fabrication of the structures and accessories shall be free from grease, oil, dirt, heat treatment scale, flux, and chemicals.

3.16 Instruction Booklet. An instruction booklet shall be provided to cover all necessary procedures for unpacking, assembly, installation, operation, recommended maintenance practices, and a complete parts list.

4. QUALITY ASSURANCE PROVISIONS

4.1 Equipment Qualification Procedure.

Procedures for obtaining equipment qualification approval are now contained in AC 150/5345-1 (latest edition), Approved Airport Lighting Equipment.

4.2 Qualification Tests.

4.2.1 Visual Examination. All components shall be visually inspected for quality of workmanship, fabrication, finish, and adequacy for the intended purpose. The structure shall be weighed to prove conformance to 3.7.

4.2.2 Salt Spray Test. The salt spray test will be conducted on a section of the mast, complete with all accessory hardware, in accordance with MIL-STD-810, Method 509. Deterioration of the base metal of any part will be cause for rejection.

4.2.3 Assembly Test. A structure shall be assembled and erected to demonstrate that all parts fit together properly, that no special tools are necessary for the purpose, and to insure that the light heads can be raised, lowered, and adjusted.

4.2.4 Deflection Test. A structure, 40 feet in height, installed as intended to be used, shall have a load, calculated from wind pressures at 60 miles per hour with 1/2 inch ice coating, applied to the structure perpendicular to the vertical axis of the structure. The deflection shall not exceed the values specified in 3.10.

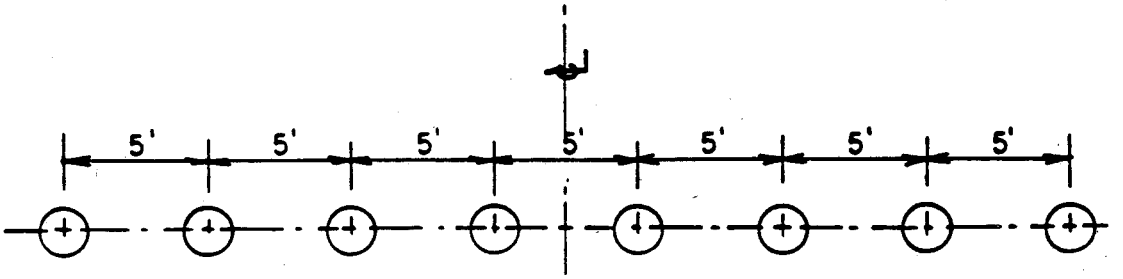
4.2.5 Strength Validation Test. A structure, 40 feet in height, shall be subjected to wind pressures for the class of structure under test as specified in 1.2. The structure shall return to its original position after the load is removed and shall not have any permanent deformation.

4.2.6 Maintenance Performance Test. A demonstration shall be conducted to verify that one man can safely perform the necessary maintenance operations on the lights and that, for the climb to service type, the support does not deflect more than permitted in 3.11.2.

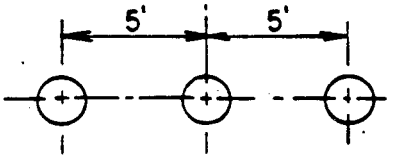
5. PREPARATION FOR DELIVERY

5.1 General. Unless otherwise specified in the order or contract, the supports shall be prepared for domestic shipment.

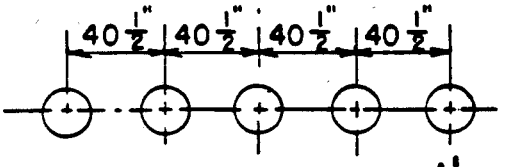
5.2 Packaging. Each structure shall be packed to protect small parts and to prevent damage during shipment. Containers shall be clearly marked as to the contents, type, class, and height of structure, or the component part of the structure if shipped in more than one package.



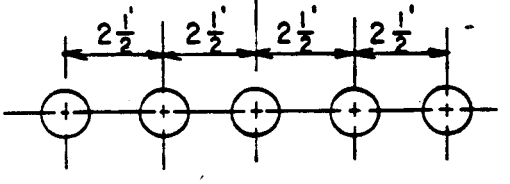
(a) 8 PAR-56 LIGHTS - 35' TOTAL



(b) 3 PAR-56 LIGHTS - 10' TOTAL



(c) 5 PAR-56 LIGHTS - $13\frac{1}{2}'$ TOTAL



(d) 5 PAR-38 LIGHTS - 10' - TOTAL

FIGURE 1 - LIGHT SPACINGS